BC95
Release Notes and FAQs

NB-IoT Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2017-02-22	Donald TANG	Initial
1.1	2017-04-28	Donald TANG	1. Modified the document name from *Quectel_BC95_B650_Version_Application_Notes _and_FAQs* to *Quectel_BC95_Release_Notes_ and_FAQs* 2. Added description of module firmware versions and compatible BTS versions 3. Modified the description of transition among network connection modes
1.2	2017-05-05	Donald TANG	Updated module firmware versions and compatible Huawei BTS versions in Table 1
1.3	2017-07-03	Donald TANG	1. Updated the description of configuring CDP server and sending UDP messages 2. Added frequency band of B28 3. Added note about configuring baud rate by AT+NATSPEED 4. Added information that BC95 module supports cell reselection function since B657 version
1.4	2017-08-10	Donald TANG	1. Added description of cell reselection 2. Updated module firmware versions and compatible BTS versions 3. Updated description of writing IMEI number 4. Added description of upgrading firmware 5. Updated description of PSM
1.5	2017-09-20	Arnold ZHAO	1. Added Description of solutions for ERROR 513 2. Added the baud rate features of BC95 module 3. Added information that command echoing function is supported since B657SP2 version

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1 Introduction

This document mainly describes release notes and some frequently asked questions (FAQs) for Quectel BC95 module.

2 Release Notes

2.1. Solutions for ERROR 513

After sending a message via **AT+NMGS** command, if **OK** is returned, it means that the IoT platform has been registered and the message has been sent successfully. If **+CME ERROR: 513** is received (**AT+CMEE=1** should be set first), it is suggested that customers should implement the two solutions below to solve the issue:

1. Re-send the message after a delay of 10s~20s.
2. Execute **AT+NMSTATUS?** command to query whether the IoT platform has been successfully registered, if **+NMSTATUS:MO_DATA_ENABLED** is returned (which means successfully registered), then please re-send the message.

2.2. The Baud Rate Features of BC95 Module

The following table shows the baud rate range of 9600bps and 4800bps for main UART port of BC95 module. When select an external MCU, please pay attention that the baud rate of its UART port cannot exceed the allowable values below, otherwise a communication failure will occur. Please refer to **AT+NATSPEED** command in *Quectel_BC95_AT_Commands_Maual* to select a proper value for **<sync_mode>** and **<stopbits>**.

Table 1: Referenced Baud Rate Range of BC95 Module

Baud Rate	Sync Mode	Stop Bit	Under 25°C				Under -40°C				Under 85°C			
			Min (bps)	Max (bps)	Error (%) Negative	Positive	Min (bps)	Max (bps)	Error (%) Negative	Positive	Min (bps)	Max (bps)	Error (%) Negative	Positive
9600	0	1	9220	9640	-4.0%	0.4%	9220	9640	-4.0%	0.4%	9220	9630	-4.0%	0.3%
		2	9220	9830	-4.0%	2.4%	9220	9820	-4.0%	2.3%	9220	9830	-4.0%	2.4%
	1	1	9220	9640	-4.0%	0.4%	9220	9630	-4.0%	0.3%	9220	9630	-4.0%	0.3%
		2	9220	9710	-4.0%	1.1%	9220	9710	-4.0%	1.1%	9220	9710	-4.0%	1.1%
	2	1	9520	9930	-0.8%	3.4%	9520	9930	-0.8%	3.4%	9520	9930	-0.8%	3.4%
		2	9520	10080	-0.8%	5.0%	9520	10080	-0.8%	5.0%	9520	10080	-0.8%	5.0%
	3	1	9560	9930	-0.4%	3.4%	9560	9930	-0.4%	3.4%	9560	9930	-0.4%	3.4%
		2	9560	10110	-0.4%	5.3%	9560	10110	-0.4%	5.3%	9560	10110	-0.4%	5.3%
4800	0	1	4610	4960	-4.0%	3.3%	4610	4960	-4.0%	3.3%	4610	4960	-4.0%	3.3%
		2	4610	4990	-4.0%	4.0%	4610	4990	-4.0%	4.0%	4610	4990	-4.0%	4.0%
	1	1	4570	4890	-4.8%	1.9%	4570	4890	-4.8%	1.9%	4570	4890	-4.8%	1.9%
		2	4540	4990	-5.4%	4.0%	4540	4990	-5.4%	4.0%	4540	4990	-5.4%	4.0%
	2	1	4610	4960	-4.0%	3.3%	4610	4960	-4.0%	3.3%	4610	4960	-4.0%	3.3%
		2	4610	5060	-4.0%	5.4%	4610	5060	-4.0%	5.4%	4610	5060	-4.0%	5.4%

2.3. Cell Reselection

Since B657SP1 version, BC95 module supports cell reselection function. It is disabled by default, and **AT+NCONFIG?** can be used to query the status. If **CELL_RESELECTION** is "FALSE", it means this function is disabled, customers can execute **AT+NCONFIG=CELL_RESELECTION,TRUE** to enable this function. The configuration will take effect after rebooting the module by **AT+NRB** command.

2.4. The Module Firmware Versions and Compatible BTS Versions

Scrambling function is added on BC95 module since B656 version, which can be controlled through AT commands. It is enabled by default, and this function must be enabled on BTS (Base Transceiver Station) as well, otherwise the module cannot search signals to connect to the BTS. When scrambling function is disabled, this function on the BTS must be disabled too.

The following examples show how to disable and enable the scrambling function of the module.

```
//Disable scrambling function.
AT+CFUN=0
AT+NCONFIG?                                //Query whether scrambling function is enabled.
AT+NCONFIG=CR_0354_0338_SCRAMBLING,FALSE  //Disable scrambling function.
AT+NCONFIG=CR_0859_SI_AVOID,FALSE
AT+NRB                                     //Reboot the module.

//Enable scrambling function.
AT+CFUN=0
AT+NCONFIG?                                //Query whether scrambling function is disabled.
AT+NCONFIG=CR_0354_0338_SCRAMBLING,TRUE   //Enable scrambling function
AT+NCONFIG=CR_0859_SI_AVOID,TRUE
AT+NRB                                     //Reboot the module
```

If the scrambling function is disabled, the module can connect to the BTS which does not support scrambling function. The module firmware versions and compatible BTS versions are shown as below.

Table 2: Module Firmware Versions and Compatible BTS Versions

Module Firmware Version	Scrambling Function Status	Supplier	Compatible BTS Version	Remark
B657SP1	Enabled	Huawei	BTS3900V100R012C10SPC230	

B656 ~ B657SP1	Enabled	Huawei	BTS3900V100R012C01SPC750 or later	
B656 or later	Disabled	Huawei	From BTS3900V100R012C00SPC710 to BTS3900V100R012C01SPC750	Compatible with versions from B650SP11 to B655SP2
B650SP11 ~ B655SP2		Huawei	BTS3900V100R012C10SPC100	
B650SP8 or earlier		Huawei	BTS3900 V100R012C00SPC700 or earlier	Need to be updated
B656SP2 or later	Enabled	Nokia	FL17A	
B657SP1	Enabled	Ericsson	L17	
B656 ~ B657SP1	Enabled	Ericsson	MI17	
B655SP2 or later		ZTE	V3.40.20.10	

2.5. Write IMEI Number

Execute **AT+CGSN=1** command to query whether there is an IMEI number returned, if it is returned, then customers do not need to write the IMEI number.

If the IMEI number has been written on the previous versions, then customers still need to re-write it if being upgraded to B650 version or later. For versions earlier than B657SP1, please execute **AT+CFUN=0** command first, and then execute **AT+NTSETID=1,……** command to write the IMEI number, and **AT+CGSN=1** command to query whether the IMEI number has been successfully written. IMEI number can only be written once on versions earlier than B657SP1, and since B657SP1 version, IMEI number can be written repeatedly.

Since B650SP8 version, customers need to check whether or not a USIM card has been inserted on the module. For B650SP8~B655SP2 versions, if there is no USIM card, please execute **AT+NCONFIG?** command to query whether AUTOCONNECT is defaulted as "TRUE", if it is "TRUE", execute **AT+NCONFIG=AUTOCONNECT,FALSE** command, reboot the module and then write IMEI number; If a USIM card has been inserted, please execute **AT+CFUN=0** command and then write the IMEI number.

NOTE

IMEI number can be obtained by two ways: the one written on the label of Quectel modules; or applying to Quectel for an IMEI number. The IMEI number will be written into the module during mass production.

2.6. About AT+CFUN Command

Since B650SP8 version, customers need to check whether or not a USIM card has been inserted. If it has not been inserted, an error will be reported after executing **AT+CFUN=1**. When the module is searching or accessing the network, **AT+CFUN=0** or **AT+CFUN=1** command cannot be executed, and network attaching/detaching operation cannot be performed either, otherwise an error will be reported.

2.7. Configure CDP Server

The IMEI number should to be written before configuring CDP server, otherwise an error will be returned.

For versions earlier than B657SP1, please execute **AT+CFUN=0** command first, and then configure CDP server.

If IMEI number has been written, and error is still returned when configuring CDP server, this is because customers may have set CDP server before and the IP address has been saved into the NV. When executing **AT+CFUN=1**, the IP address must be in accordance with the one saved in NV, otherwise it will return an error. In this situation, please execute **AT+CFUN=0**, and then re-configure the CDP server. The configuration will take effect after rebooting the module by **AT+NRB** command.

Since B650SP8 version, customers need to check whether or not a USIM card has been inserted on the module. For B650SP8~B655SP2 versions, if there is no USIM card, please execute **AT+NCONFIG?** command to query whether **AUTOCONNECT** is defaulted as "TRUE", if it is "TRUE", execute **AT+NCONFIG=AUTOCONNECT,FALSE** command, reboot the module and then configure CDP server.

2.8. Attach Network

Please make sure the module type corresponds to the frequency band (**AT+NBAND?** command can be used to query the band) before attaching network.

The module's band is defaulted as 900MHz (factory setting), and it can be configured by **AT+NBAND=n** command. The configuration will take effect after rebooting the module by **AT+NRB** command.

The module type and corresponding frequency band are shown as follows:

Table 3: Module Type and Corresponding Frequency Band

Module Type	BC95-B8 (BC95-CM)	BC95-B5 (BC95-SL)	BC95-B20 (BC95-VF)	BC95-B28
Frequency band	900MHz	850MHz	800MHz	700MHz

The module can automatically attach network by default since B650 version, which is controlled by **AT+NCONFIG=AUTOCONN,TRUE** command. Customers only need to query whether the module has attached network by the following commands:

AT+NBAND?	//Query the band.
AT+CFUN?	//Value is 1.
AT+CIMI	//Query the IMSI number.
AT+CSQ	//Query the signal quality.
AT+NUESTATS	//Query the module status.
AT+CGATT?	//"**+CGATT:1**" means the module is attached successfully. Sometimes there is a delay about 30s.
AT+CEREG?	//Query the network registration status, 1 means the module has registered on the network, 2 means the module is searching the network.
AT+CSCON?	//Query the network connection mode, 1 means "Connected", 0 means "Idle".

If customers want to manually attach the network, please disable automatic network attachment by executing **AT+NCONFIG=AUTOCONNECT,FALSE**. This configuration will be saved to the NV and take effect after rebooting the module.

The following examples show two ways of manual network attachment process.

1. Do not specify PLMN.

AT+CFUN=1	
AT+CIMI	//Wait for 4s before querying the IMSI number. If IMSI number is returned, it means the card has been identified; if not returned, please check whether it is a USIM card and whether the card is properly inserted.
AT+NBAND?	//Query the band.
AT+CEREG=1	//Enable automatically reporting network registration status. When the module is registered on network, a URC will be reported.
AT+CGDCONT=1,"IP","APN"	//APN is a local access point. This step is optional. If needed, please configure it accordingly.
AT+CGATT=1(or **AT+COPS=0**)	
AT+CSQ	//Query the signal quality.
AT+NUESTATS	//Query the module status.
AT+CGATT?	//"**+CGATT:1**" means the module is attached successfully.

	Sometimes there is a delay about 30s.
AT+CEREG?	//Query the network registration status, 1 means the module has registered on the network, 2 means the module is searching the network.
AT+CSCON?	//Query the network connection mode, 1 means "Connected", 0 means "Idle".

2. Specify PLMN.

AT+CFUN=1	
AT+CIMI	//Wait for 4s before querying the IMSI number. If IMSI number is returned, it means the card has been identified; if not returned, please check whether it is a USIM card and whether the card is properly inserted.
AT+NBAND?	//Query the band.
AT+CEREG=1	//Enable automatically reporting network registration status. When the module is registered on the network, a URC will be reported.
AT+CGDCONT=1,"IP","APN"	//APN is a local access point. This step is optional. If needed, please configure it accordingly.
AT+COPS=1,2,"46000"	//Specify the PLMN searching, and PLMN needs to be configured by customers.
AT+CSQ	//Query the signal quality.
AT+NUESTATS	//Query the module status.
AT+CGATT?	//"**+CGATT:1**" means the module is attached successfully. Sometimes there is a delay about 30s.
AT+CEREG?	//Query the network registration status, 1 means the module is registered on the network, 2 means the module is searching the network.
AT+CSCON?	//Query the network connection mode, 1 means "Connected", 0 means "Idle".

2.9. Send UDP Messages

Customers need to establish a socket by **AT+NSOCR** before sending UDP messages via **AT+NSOST**.

Execute **AT+NSOCR=<type>,<protocol>,<listen port>[,<receive control>]** to create a socket:

<type>	Socket type. Supported value is DGRAM
<protocol>	Standard internet protocol definition. Supported value is 17
<listen port>	A number in the range 0-65535. This is the local port that will be included in sent messages and on which messages will be received

<receive control>	Set to 1 if incoming messages should be received, 0 if incoming messages should be ignored. Default value is 1 (message will be received)

Execute **AT+NSOST=<socket>,<remote_addr>,<remote_port>,<length>,<data>** to send UDP messages:

<socket>	Socket number returned by **AT+NSOCR**
<remote_addr>	IPv4, a dot notation IP address
<remote_port>	A number in the range 0-65535. This is the remote port on which messages will be received
<length>	Decimal length of data to be sent
<data>	Data received in hex string format, or quoted string format

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NOTE

When using **AT+NSOCR** to create a socket, **<listen port>** cannot be set as 5683 for B656SP2 version or later, otherwise an error will be returned.

2.10. Send CoAP Messages

CoAP messages can be sent after configuring CDP server, and there is no need to establish a connection. Please note that the IMEI number of the module must have been registered on NB-IoT network.

Execute **AT+NCDP=<ip_addr>,<port>** to configure CDP server. **<ip_addr>** is the network address (the network must be able to connect to the server), and **<port>** is the monitoring port set by the server. The default port is 5683.

2.11. Receive Paging Messages

The module can receive the paging messages under idle mode. Please confirm whether the base station supports receiving the paging messages if this function needs to be tested.

2.12. About Command Echoing

Since B657SP2 version, command echoing function is supported, which can be controlled by **ATE** command, and this function is disabled by default.

> **NOTE**
>
> B657SP2 refers to BC95BxHBR01A02W16 version (in which "Bx" indicates B5, B8, B20 or B28).

2.13. About Baud Rate Configuration

The main UART port is used for AT command communication and data transmission, and the baud rate is 9600bps. It can also be used for firmware upgrading, and the baud rate is 115200bps. The debug port is used to view log information and the baud rate is 921600bps.

> **NOTE**
>
> Since B656SP2 version, baud rate can be configured via **AT+NATSPEED** command.

2.14. About Firmware Upgrade and Log View

Each firmware version of BC95 module has a corresponding firmware upgrade tool (currently via main UART port) and log view tool (currently via debug port), and the corresponding tools will be attached when providing the firmware.

Since B657SP1 version, "UEUpdater" tool is used to upgrade the firmware, and customers need to erase the flash before upgrading to B657SP1 version.

3 FAQs

1) Q: How can network connection modes be switched on the module?

   A: The module has three kinds of network connection modes:

   a) Connected (**+CSCON:0,1**. When the module has attached the network, it will be in this mode). The duration time is controlled by a timer on base station. The range is from 1s to 3600s, and the default value is 20s.

   b) Idle (**+CSCON:0,0**). The duration time is controlled by active timer (T3324) on the network. The range is from 0s to 11160s, and the default value is 10s.

   c) PSM (can be identified by power consumption, maximum power consumption is 5uA under PSM). The duration time is configured by the core network, and controlled by TAU timer (extended) T3412. The range is from 0h to 320h. The default value of T3412 timer is 54min, and the maximum value is 192min. The maximum value of extended value is 320h. If the two values exist at the same time, the module is controlled by the extended value. Please refer to *3GPP TS 24.301 (Rel. 13)* for details.

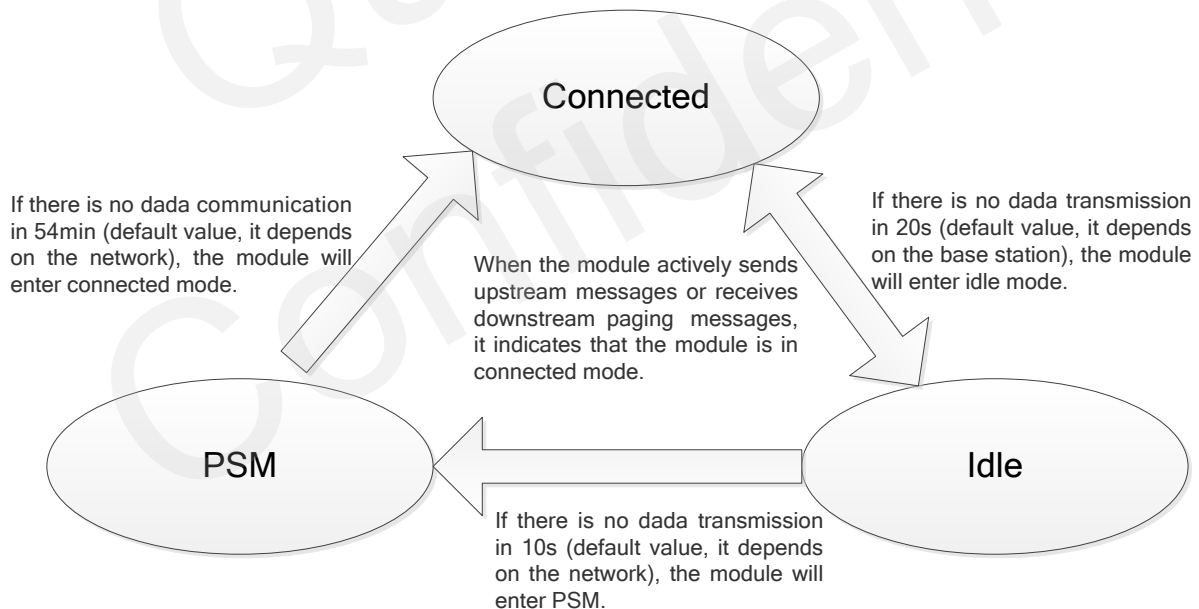The following figure shows the transition among the network connection modes:

If there is no dada communication in 54min (default value, it depends on the network), the module will enter connected mode.

When the module actively sends upstream messages or receives downstream paging messages, it indicates that the module is in connected mode.

If there is no dada transmission in 20s (default value, it depends on the base station), the module will enter idle mode.

If there is no dada transmission in 10s (default value, it depends on the network), the module will enter PSM.

Connected

PSM

Idle

Figure 1: Transition among Network Connection Modes

> **NOTES**
>
> 1. UDP/CoAP upstream messages can be sent under these three modes; sending downstream messages under idle mode or PSM mode will make the module enter connected mode; when TAU timer expires, the module will be woken and enter connected mode.
> 2. When downstream messages are received under idle mode, the module enters connected mode, and downstream messages cannot be received under PSM.
> 3. TAU timer value refers to the duration from the moment that the idle mode starts to the moment the PSM ends.

2) Q: When sending CoAP messages, the IP address of CDP server needs to be configured and the server depends on network operators or test environment providers, then how about sending UDP messages?

   A: CDP server is provided by test environment providers, and UDP server can be set up by customers.

3) Q: There are three kinds of network connection modes on BC95, which are connected mode, idle mode and PSM mode, whether the transition among them is controlled by BC95 or by connected devices?

   A: The transition is controlled by BC95 through a timer in it, and the timer value depends on the network; connected devices can activate communication function no matter the module is in idle mode or in PSM mode.

4) Q: When BC95 is in low power consumption mode, whether it is always connected with the server? Whether the messages sent by the server can always be received?

   A: When BC95 is in a deep sleep mode, it will be disconnected with the server; the network side cannot page to the device until the module is connected to the server.

5) Q: When sending CoAP messages, CDP server must be configured, then how to configure on CDP or Huawei IoT platform?

   A: The server depends on network operators or test environment providers, for the module, only the IP address of the server is configured.

6) Q: Whether the module supports TCP protocol and whether it supports writing SIM card number?

   A: Neither of them is supported. Currently only CoAP and UDP protocols are supported and the module can only use USIM card.

7) Q: For CoAP messages and UDP messages, can I choose one of them or they must be chosen simultaneously?

   A: Both of them can be chosen. CoAP is an application layer protocol based on UDP.

8) Q: Whether "**+NSONMI:0,4**" URC is automatically outputted by the module to notify the MCU, or it is sent by MCU?

   A: This URC is outputted by the module when it receives UDP messages. The first parameter is the

socket, and the second parameter is the length of the received data. Whether or not to report the URC is determined by the last parameter in the command **AT+NSOCR=DGRAM,17,4587,1**. Please refer to *Quectel_BC95_AT_Commands_Manual* for more details.

9) Q: Whether operators (such as China Mobile/Unicom/Telecom) can be supported simultaneously or only one can be supported at one time? If only one can be supported at one time, is there a way to identify?

    A: The module supports China Mobile, China Unicom and China Telecom. Currently it only supports single frequency, listed as below:

    - BC95-CM/ BC95-B8   900MHz
    - BC95-SL/ BC95-B5   850MHz
    - BC95-VF/ BC95-B20   800MHz
    - BC95-B28   700MHz

10) Q: Which bands does the module support for different operators currently?

    A: The module supports 800MHz for China Telecom (actually this band is within the range of 850MHz on BC95-B5), 900MHz for China Mobile and 900MHZ/1800MHz for China Unicom.

11) Q: Whether cell switch is supported?

    A: Cell switch function is not supported.